

REMOTE SENSING OF THE SOLAR WIND II RADIO SCATTERING AND SCINTILLATION MEASUREMENTS

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The solar wind is highly complex and exhibits structure and phenomena varying over an extensive range of spatial and temporal scales. Although our knowledge and understanding of the solar wind has improved with the enormous quantity of in situ measurements returned by numerous spacecraft missions since 1962, it is far from complete. Exploration continues with Ulysses on its way out of the ecliptic plane, and the Voyager and Pioneer spacecraft searching for the outer reaches of the heliosphere. Although measurements in the region near the Sun are crucial for understanding the evolution of the inner solar wind, direct measurements have not yet been possible inside 0.3 AU. In the mean time, we must rely on indirect remote sensing measurements, of which measurements based on radio propagation through the turbulent solar wind plasma have played a major role.

Recent progress in the analysis of radio scattering and scintillation measurements with monochromatic spacecraft radio signals has resulted in significant new information on structure and properties of the near-Sun solar wind. The purpose of this paper is to briefly review the remote sensing capabilities of these radio scattering observations, and to show how they have been exploited to obtain details of the global large-scale structure in the solar wind and its evolution with heliocentric distance. The solar wind results are exciting, because they bridge the gap between solar and in situ solar wind observations, and reveal features that can be related to features in both solar and in situ plasma measurements beyond 0.3 AU.